A LECTURE

ON THE

PRESERVATION OF TIMBER

BY

KYAN'S PATENT

FOR

PREVENTING DRY ROT;

DELIVERED BY

DOCTOR BIRKBECK,

AT THE SOCIETY OF ARTS, ADELPHI; DECEMBER 9, 1834.

WITH AN APPENDIX, &c.

LONDON:
PUBLISHED BY JOHN WEALE,
(TAYLOR'S ARCHITECTURAL LIBRARY,) 59, HIGH HOLBORN;
SOLD ALSO BY
J. W. NORIE, AND CO. 157, LEADENHALL STREET, AND
J. R. HARDY AND SON, HIGH STREET, SHADWELL.

Price One Shilling.

PRINTED BY J. AND C. ADLARD,
BARTHOLOMEW CLOSE.

ON

THE PRESERVATION OF TIMBER FROM DRY ROT.

It has been emphatically enquired, (remarked Dr. Birkbeck,) "Where is the dust that hath not been alive?"—Organized matter, when deprived of the protection of the vital powers, no longer preserves its constrained combination, but yields to the dissevering influence of the affinities which actuate the ordinary particles of matter, and, as has been truly said,

> "All forms that perish other forms supply,
> By turns we catch the vital breath and die."

To counteract the operation of these decomposing affinities, and to prevent the return of organized beings to the dust from whence they were formed, has been an object, through every age, from the earliest periods of time, of deep and powerful interest. In Egypt, "the Cradle of Science," we find an art early prevailed whereby the tendency of animal matter to decomposition was for a long time effectually checked; and where, also, a contrivance was employed for preserving, to a very considerable extent, the vegetable substances, and other matter by which it

was surrounded, from decay. It does not appear, however, that these early attempts were dictated by anything like a systematic or scientific knowledge of the object they had in view, either with regard to the nature of those compound bodies which it was the intention to preserve, or of the materials which were employed, for the purpose of arresting natural and inevitable decay.

Later periods have witnessed many similar attempts; but it was not till the eighteenth century that any process was conducted upon principles approaching to scientific rationale.

With respect to the preservation of vegetable matter, which it is more particularly our object to consider this evening, it appears that, previous to the year 1740, very little was known of methods to correct vegetable decomposition. At that period, however, it was proposed, by an individual named Reid, to arrest decay by means of a certain vegetable acid; and then, in a few years afterwards, about 1769, Mr. Jackson proposed a very complicated lixivium, in which vegetable bodies were to be immersed to protect them against decay. With total disregard of all chemical principles, he composed a lixivium of the *Muriate of Soda, Epsom Salts, Lime, Potash, Saltwater,* and several other substances. Mr. Jackson had an opportunity of employing it in the preparation of the wood of several Frigates, and other vessels in the Navy; but the result was, that those vessels built with wood prepared according to his

method were less durable than those which had been ordinarily constructed.

Shortly afterwards, a person named Lewis attempted to accomplish the Preservation of Timber from decay by means of Lime. The Amethyst Frigate was assigned for his experiment; but decay was found to attack the vessel more rapidly than in ordinary cases. This substance (lime) has been lately brought forward as a protection to wood by Mr. Knowles, who has written ably on the subject of the Navy, and whose process is commended by two individuals, in the Appendix to the 49th Volume of the Transactions of the Society of Arts: one, whose sentiments are derived from a Paper he presented to the Society; and the other by a Letter addressed to the Society. The former states, that by placing pieces of wood, surrounded by pounded lime, in spaces below the surface of the earth, they are so acted upon, that when removed about the end of twelve months they are protected against all the ordinary causes of decay.—Now (said Dr. Birkbeck,) here mark, assuming such principle to be correct, the inconsistency which occurs with respect to animal and vegetable matter; and he (Dr. B.) would venture to say, that whatever is true with respect to the protection of the one, will be found equally true with respect to the protection of the other. All are aware that when the dead among human beings are to be rapidly dissolved or disorganized, *quick lime* is thrown into the pit in which they are deposited, not for the purpose of protection from decay,

but for the very reverse. Yet this is the substance which, upon various occasions, and perhaps more extensively than any other, has had its preservative powers boasted of by different writers.

The next claim to prevention from Dry Rot was about the year 1808, when Carbonized Wood was asserted to be completely protected against decay; but soon the fallacy of this opinion was discovered. Then Sulphate of Iron and Mundic were proposed for the purpose; and, subsequently, the proposition of Mr. Langton, which is perhaps the best of them all. He went a little farther than his predecessors, and suggested that oil and pyroligneous acid should be made to penetrate the interior of the wood, by the previous removal of the atmospheric air, by means of a large air pump, and a subsequent impulsion by the pressure of the atmosphere of the preserving matter into those spaces from which it had been withdrawn. It is clear, however, that Langton's method admits of great objection; and it is moreover obvious, that in his proposal there is nothing directed against the *root* of the mischief which he proposes to remedy.

I believe, (remarked Dr. Birkbeck,) I may safely assert, that of all the remedies that have ever been proposed, the plan of Mr. KYAN will be found the most effectual: and I have greater pleasure in expounding this method, because it enables me to enter into that which, I think, has not yet been generally understood, viz. the rationale of the process.

A very effectual procedure has taken place in regard to one form of animal matter, by the preservation of the skin from natural decay in a process known by the name of "Tanning." This process will give a very good idea of Mr. Kyan's invention. Tanning consists in protecting the leather and skin by the introduction of TANNIN, which is generally derived from an infusion or decoction of the bark of the oak. If no change were produced in the gelatine, which makes the largest part of the skin to be immersed in the tan-pit, it would undergo certain chemical changes,—it would putrefy, and lose its tenacity; but if a portion of animal jelly is dissolved in water, and a little of the substance added, smilar to the tannin, a combination will take place between the tannin and the gelatine, a precipitate will follow of the animal matter, which is the tanno-gelatine, or a compound of tannin and gelatine, and is precisely that substance which is formed in the leather, and gives to it durability and power to resist the causes of decay. The same intention exists in the process of Mr. Kyan. It is true he does not act on the gelatine of animal matter, but he does on the albumen—*one of the proximate principles of vegetable matter,* which appears to have been slightly perceived by Fourcroy, but which was actually discovered by Berzelius about the year 1813.

In order to obtain this vegetable matter, *(albumen,)* there are various substances which may be employed. The Hibiscus Esculentus yields it in

considerable abundance: it is a West Indian plant, which Dr. Clarke mentions as adopted, in Demerara, for the same purpose, as, in the other Islands, the white of eggs and blood are employed in the process of clarifying sugar. The Ficus Indica, also, if divided at the stem, will exude a considerable quantity of this matter. If the solution of the Bichloride of Mercury, (which is the agent adopted by Mr. Kyan,) is added to the vegetable matter, Albumen, it will be found, when they come in contact, that decomposition occurs.

Dr. Birkbeck here took an albumenous solution collected, from the Hyacinth, and the moment it came in contact with the solution of Bichloride of Mercury, a precipitation took place. The analysis of the result performed by Fourcroy, and subsequently by Berzelius and others, is, that the *bichloride* of Mercury has been converted into *protochloride*. In that form it combines with the albumen, which, being no longer soluble, descends in a visible form with the protochloride. In the change, the bichloride loses one proportion of its chlorine. Bichloride of Mercury consists of 200 parts, or one proportion of mercury, and 72, or two proportions of chlorine. One proportional is separated in this process, leaving the protochloride 200 parts of mercury and 36 of chlorine; that is, one proportional of mercury and one of chlorine; and the albumen, being separated along with the protochloride or calomel, descends.

Mr. Kyan, who had been for a series of years

(since 1812) engaged in trying a variety of experiments on the preservation of timber, was led to the present experiment by having, as he conceived, at length ascertained that *albumen* was the primary cause of putrefactive fermentation, and subsequently of the decomposition of vegetable matter. Aware of the established affinity of corrosive sublimate for this material, he applied that substance to solutions of vegetable matter, both acetous and saccharine, on which he was then operating, and in which albumen was a constituent, with a view to preserve them in a quiescent and incorruptible state, and obtaining a confirmation of his opinions by the fact, that during a period of three years, the acetous solution openly exposed to atmospheric air had not become putrid, nor had the saccharine decoction yielded to the vinous or acetous stages of fermentation, but were in a high state of preservation; he concluded that corrosive sublimate, by combination with albumen, was a protection against the natural changes of vegetable matter. He was further confirmed in his opinions by having understood that Sir Humphry Davy and several others had noticed, that corrosive muriate of mercury, as it was formerly termed, had the effect of preserving animal matter, and that it was used by the natural historian for the purpose of preserving his subjects. Extending this view by a very judicious hypothetical analogy, Mr. Kyan argued that if the albumen found in these fluids be the cause of

their liability to change, and if it make a part of the substance of wood, then the introduction of this solution into that wood must be the means of preserving it from decay; and he reasoned with great correctness respecting the nature of albumen in wood. He inferred that, as wood consists of various successive layers, in which the albumen, or juices containing albumen, circulated freely, it is quite certain that as these juices within the wood, with the watery parts, fly off by the leaves, that the albumen remains behind; and it is probable that this albumen, which from its nature is peculiarly prone to enter into new combinations, is the thing in wood which begins the tendency to decomposition, and produces ultimate decay; whether that decomposition is attended with the formation of cryptogamic substances, or whether, in the less organized form, the change occurs with the simple production of what has been called the Dry Rot.

He (Mr. Kyan) conceived, therefore, if albumen made a part of wood, the latter would be protected by converting that albumen into a compound of protochloride of mercury and albumen; and he proceeded to immerse pieces of wood in this solution, and obtained the same result as that which he had ascertained with regard to the vegetable decoctions. Having done so, it became necessary to employ various modes of experiment, as well as comparative experiments, which, in the course of the Lecture,

Fig. 1.

Fig. 2.

would be described. Now, it is not clear in what part of the wood the vegetable albumen may be found, though it exists more especially in that part of the tree which is denominated the alburnum or sap, and is found between the heart-wood and the innermost layer of bark. The experience of all practical men has confirmed the opinion that this portion of wood is the first to decay.

If a piece of wood is squared in the manner described in the section (see Fig. 1), instead of taking off the whole of the alburnum, which is exhibited in the diagram by the broad light circle between the bark and heart-wood, and if this timber became a part of the ground joist, girders, beams, or rafters, it would be very soon discovered, that the change which is denominated Dry Rot, but which may be simply termed vegetable decomposition, would occur in those parts of the timber where the sap or alburnum is left; and, as decay is progressive, would then proceed from the angles throughout the whole of the wood. Here will be obvious the great benefit of Mr. Kyan's process, which preserves even the alburnum or sap from decay. At present it is the custom to square timber, exclusive of all sap, as is shewn by the section, (see Fig. 2.) The difference of the cubical contents in two logs of timber will be easily perceived; and when it is considered how much timber will be thus rendered serviceable, the discovery of Mr. Kyan deserves the most serious attention.

It is probable that, as the alburnum becomes suc-

cessive layers of wood, it loses a quantity of albumen, or that, in consequence of the pressure which takes place by the addition of each successive layer, it becomes so situated as to lose a part of its exposure to the vessels where a change may occur, and therefore becomes in some measure protected. For that which is one year alburnum or sap may be, and indeed generally is, proper wood the next.

It might be imagined there would be a great difficulty in the transmission of the protecting solution through the substance of the wood, so as to reach its central parts. In order to show that this is practicable, a few simple experiments with the air-pump were resorted to.

A great diversity of opinion has prevailed with respect to the elementary organs comprised in wood. They are generally reckoned four:—the cells, the woody fibre, the sap vessels, and the spiral vessels. It is much contested by a recent vegetable anatomist (De Candolle,) whether there are any vessels that pass from one end to the other, or whether the whole of the texture is not made up itself of cells of various degrees of elongation, sometimes circular, sometimes elliptical, occasionally hexagonal, and sometimes very much elongated, but yet not otherwise than cellular.

If any confirmation were wanting of the passage of fluid through the woody structure, it can be obtained by the assistance of the air-pump, in allowing the air to pass through a piece of wood covered laterally with sealing-wax, so as to prevent

its entering *laterally*, and of such a length that if it had not entire longitudinal vessels it would be impossible for air, urged by the pressure of the atmosphere, to pass. It then must be admitted, that if air will pass through it, water will also. For it has been asserted, for what reason is not quite clear, that particles of water are smaller than particles of air; and that through whatever pores air can be made to pass, water will certainly penetrate.

In this experiment it will be observed that the air passes with the greatest facility from one end of the wood to the other, and the number of globular particles collected at the lower extremity will show the transit of air to be very great. That it is air, may be proved by placing the hand on the surface of the wood, when very little will pass; and when the hand is removed, it will become abundant. This will sufficiently show the air must have passed through the wood, and has therefore found spaces which are permeable to it. But that there also exists a quantity of air in the wood will be made apparent by taking a piece of wood and removing the resident air, when it will become much heavier. Solid as the piece of wood may appear, it will afford air in great abundance; and, although it may appear generally to float, it is much heavier than water. The pine or the elm has the specific gravity of 1.46, and the oak 1.54; so that, it is obvious, when they are deprived of the air which gives them buoyancy, they must sink in water.

The air being removed, certain spaces must have been left vacant; and if it be true that air, by the force of atmospheric pressure, can be made to penetrate the substance of wood, there is reason to believe that when wood is exposed to the operation of Mr. Kyan's process, water may be made to enter. That which is accomplished by removing the pressure of the atmosphere, is effected by the affinity of the bichloride of mercury for the albumen, with which it has come in contact when it enters the vessels of the wood. After the immersion of timber in the solution for about twelve hours, something like the ebullition of soda-water will be perceived, which arises partly from the chlorine proceeding from the solution, and partly from the air contained in the wood itself. The wood being filled with the solution, ebullition ceases, because the bichloride has been converted into protochloride, and there is no longer any escape of the other proportion of the chlorine, which constitutes the bichloride.

Wood is also penetrable by substances, which, though apparently fluid, are of a species of fluidity different to water. Dr. Birkbeck made an experiment by taking a piece of wood of great firmness and protected laterally by sealing-wax to prevent the air escaping, and caused a quantity of mercury to pass through it. The mercury was placed under the pressure of the atmosphere by the air-pump, so that it might have additional force to its own weight, and the mercury was seen descending in a

rapid manner by a vast number of streams through the extremity of the wood. There was, therefore, sufficient reason to believe that wood is penetrable to fluid; and, according to the observations previously offered, that albumen makes a part of the wood. Albumen is a substance exceedingly disposed to change, and might be expected to be so from its being a quaternary compound. Gay Lussac, in analysing animal albumen, has found that it consists of 2 parts of nitrogen, 6 of oxygen, 17 of carbon, and 13 of hydrogen; or

Nitrogen . . .	15.705
Oxygen . . .	23.872
Carbon . . .	52.883
Hydrogen . . .	7.540
	100.

And it is probable, if vegetable albumen were analysed, these would be found to be its parts existing in nearly the same proportion. In all compounds, the more numerous the ingredients the weaker is their affinity. The most beautiful and elaborate of the compounds which nature has produced,—the vegetable and animal compounds, — on account of that affinity which results from their complicated forms, change more quickly than those compounds which are merely binary, and which form such compounds ultimately. Thus, for example, if 1000 parts of gum be taken, it will be found to consist of 586 parts of water, or oxygen and hydrogen in the exact proportions which form that quantity of water, and 414 of carbon, and is therefore a hydrate of carbon.

Lignin was also found in the analysis of Dr. Prout to consist of 500 parts of water and 500 of carbon in 1000. So that, in the decomposition of woody matter or gum, the tendency is, first, to arrange themselves in one compound—water; and then, if any oxygen be present, to give to the carbon that oxygen, and thus form a second minor compound—carbonic acid. Vegetable albumen is, therefore, more easily decompounded, and sooner falls to decay than any other. It is also the seat of another extraordinary change: in it are the germs of various fungous bodies, of the Boletus, Agaricus, Lycoperdon, Mucor, &c., which occasionally expand or germinate. The germination, however, is not produced by decomposition, nor does it produce decomposition, but simply occurs because a soil is provided for the germs by the decomposition of the albumen: and this is the first sign, in many instances, of the occurrence of Dry Rot. It will easily be seen that germs will pass through tubes which mercury and water will pass, because there are new animal existences brought to our knowledge, which are far smaller in all probability than the substances which have penetrated vegetable bodies. For instance, the Monas and others of the order of Infusoria, of which Professor Ehrenberg gives an account, and states that in the twelfth part of an inch there are 28,000, and in an entire square inch no less than 500,000,000: hence it will be easily understood there may be vegetable germs small enough to be introduced through the

spongioles of the roots. They acquire a residence in those particular vessels where albumen abounds, and there, in consequence of decomposition of the albuminous matter, begin to vegetate, and form those parasitical productions which have been absurdly said by some writers, at the commencement of the present century, to be the cause, and not the effect, of the dry rot. Dr. Birkbeck here exhibited a Fungus, which was taken from some timber at Shoreditch church, and owed its existence entirely to the decomposition that had there occurred.

Some very remarkable instances are related in a late number of the Quarterly Review, concerning an extensive rotting in a quantity of timber in one of the Government yards, where destruction took place to a very great extent without the slightest appearance of any of those fungous productions, though there were some instances in which fungous productions did occur.

It might be said if water was necessary to the decomposition of albumen, the ordinary process of seasoning, which consists in simply placing the wood where it may dry, is sufficient alone to prevent decomposition, because the water by that process would be removed. It must be remembered, however, that the utmost drying that has ever been effected, either by long exposure to the sun and air, or by enclosure in rooms heated with air or steam, never succeeds in removing the whole of the water from the substance of the wood. Count Rumford found, after having done all he could to dry a piece

of wood, that it contained one-fourth part of its weight of water, and that in ordinary cases two-fifths only consisted of solid matter. This is quite enough to begin the decomposition, and, therefore, if the difficulty of freeing the wood from that portion of water alone existed, it would be sufficient to induce the adoption of a mode rendering the albumen undecomposable in despite of the water, which can never be removed.

Dr. Birkbeck then observed, that, having now examined the properties of the agent by which the effect intended is to be produced,—the nature of the substance on which it is designed to act,—and the condition of the cavities and spaces within which the action is to occur,—the result of the experiments performed by Mr. Kyan will be better understood.

After immersing the wood in a solution of the corrosive sublimate, it still remains in a state to influence chemical tests or agents; so that at any time it will be easy to detect, by a simple experiment, whether timber has been prepared by Mr. Kyan's process. The effect may be observed by taking a piece of simple deal, that has not undergone the process, and applying a few drops of hydro-sulphuret of ammonia, when no effect will be produced; but when the same test is applied to a piece of wood which has been immersed in the solution, a dark stain will be instantly left upon it. Thus the presence of the protecting substance is proved by the contact of a little hydro-sulphuret of ammonia, occa-

sioning no change in the simple wood, and producing a black mark instantaneously on its application to wood previously immersed in the solution of corrosive sublimate. This evidently shows that among the fibres, in the very substance of the wood, some of the calomel remains behind. It was the case with some specimens of linen examined by Professor Faraday, which had been long immersed in the solution of corrosive sublimate. Upon simply washing in water, he found they yielded no evidence of any process having taken place, but when he applied nitric acid he obtained an action of the mercurial matter within the substance, and rendered it evident.

The manner in which the efficacy of Mr. Kyan's process can be demonstrated is exceedingly simple. Dr. B. shewed two pieces of linen, one subjected to immersion in the solution of bichloride of mercury; the other in its ordinary state. The piece which had been immersed, after remaining in the Fungus Pit, where all was decaying around, had not lost any of its tenacity of substance, nor was it in the slightest degree impaired. Substances of this kind, placed in an ordinary cellar, would undergo a change similar to that of the piece not prepared. It appeared, decayed, as if it had been burned, yet it had had no fire; its elements had been rent asunder by their own action, aided by the circumstances in which the vegetable matter was placed. There was before him another specimen of linen that had been placed

in a cellar in the neighbourhood of Waterloo Bridge. Though a canvass of considerable thickness, by being placed in a situation of a certain temperature that was damp, it had been rendered perfectly fragile, and its tenacity completely destroyed. Likewise cords on which weights had been suspended, in a similar situation, had become so brittle that the weights were permitted to fall. But the samples prepared by Mr. Kyan exhibited no appearance of mildew or dustiness, none of the powder of decomposition which the others presented. They retained the whole firmness of their fabric, and exhibited full proof that vegetable matter, in its more simple form, is rendered perfectly secure, by the power of corrosive sublimate, against the influence of mildew and damp, as well as the other causes of Dry Rot in vegetable matter.

He requested attention and observation to the hollow and decayed condition of a section, on the table, of a mast; its outside appeared exceedingly fair and sufficient, but on looking down into the middle of what ought to be its substance, it was a mere shell of wood; so that there remained but an external substance of about an inch in thickness, which, under certain circumstances of difficulty, would become totally inefficient, and lead to the destruction of the vessel. It appears as if it had been bored out, and that the Dry Rot had acted like an auger, and made almost a cylindrical hole. It had decayed regularly according to the manner in

which the albumen was arranged; and it is probable, on account of the external strata having been better dried before the paint was applied, they had retained their firmness, while the interior, though better circumstanced with respect to decay, had been entirely destroyed.

He had also some comparative experiments of great importance: two pieces of wood, which were placed together in a pit in Westminster, where a great deal of rotting was going on; that which had been previously immersed was perfectly sound, while the other, to which nothing had been done, might be picked to pieces, and was unable to resist the lightest force applied to it. These being pieces of the same wood, and the same part of the wood, were a fair comparative experiment. There were also two slabs of deal, which had been allowed to retain a portion of alburnum. In that part of the wedge which had undergone no preparation, the alburnum was perfectly pulverulent, and crumbled into a powder beneath the pressure of the fingers. The other piece of this sappy wood, which had been prepared, was like heartwood, and manifested no tendency to crumble, though it had been cut with a knife.

In like manner, in two specimens of wood cleft from each other, the one prepared by immersion in the solution, and the other unprepared, the same relative hardness and want of hardness was exhibited; so that, even in this instance, the material

advantage of this process of preparing was evident, for that sap which would not answer for use may be made useful by the hardening and preserving effects of the solution.

The next specimens before him were two pieces of wood, prepared and unprepared, which were placed beneath a floor at the house of Messrs. Harris and Warner, hatters, in Southwark. The spot in which they were placed was so efficacious in producing Dry Rot, that every three years the floors were obliged to be relaid. In the course of three years the unprepared piece of flooring had lost all tenacity, and would serve no purpose for which a floor could be desired, while the piece lying along with it, having been previously immersed in the solution, manifested not the slightest appearance of decay, and had produced no animal or vegetable matter, but became harder and more perfect than when it was taken from the sound tree. Facts of this kind, attested by the parties who witnessed the progress and result of these experiments, appeared to him (Dr. B.) completely to settle the question.

He (Dr. B.) would now mention some instances of Dry Rot that had occurred recently.—A number of fragments were before the members, which were removed from the floor of the London Institution, on the occasion of some recent repairs. This building had been erected about nineteen years. It is true it was erected on a spot that not long ago was

little better than a swamp or morass; but the architect had placed the floor on timber that was supported at a considerable height above the ground, by means of iron pedestals. In spite of all this, however, about three years ago, when there happened to be some pressure, the floor gave way. The wood could be pulled in pieces with the greatest ease, and was deprived of that character which would render it fit for building. The floor had been entirely removed, and wood prepared by Mr. Kyan wisely introduced; and he (Dr. B.) trusted that some persons present, who might live to see any repairs hereafter performed, would compare the effect of similar causes operating on prepared and unprepared wood.

Another important advantage arising from Mr. Kyan's process was, that wood of a very inferior description could be rendered fit for the ordinary purposes of building. On the table was a piece of green larch, such as was to be used for sleepers in the construction of the Southampton Railway. When it was put into the solution, it had cracked in various radial directions—some of the openings being large enough to admit a penny-piece. The wood was now rendered perfectly solid, and a slight alteration in the level shewed where the fissures had been. This was a remarkable illustration of the manner in which the corrosive sublimate acts upon the wood. The diameter, which had been perfectly level, was now distinctly curved; and

the two extremities were gathered up toward the vertical part of the wood. The spherical surface was given to the diameter by the process, when all the parts which were separated became dragged together; and the result was, that it had acquired a degree of firmness it would never otherwise have had, and was now fit to be employed at any time for any of the purposes for which wood may be used. Thus, by the change this process effects, in many species of wood, that which would be rejected on account of insufficiency will be rendered competent for every purpose the architect may desire.

It is not, however, to these larger concerns this process is alone applicable: it might be applied with equal effect to Casks, &c., and more particularly for the preservation of Hop-poles; and if a calculation were made of the number consumed, it would be found to be no inconsiderable matter. If the number of acres occupied in the cultivation of hops in the Kingdom is taken to be 50,000, and if the cultivator every year is exposed to a cost of 10*l.* for the supply of new poles, and for the repair of old ones, upon every acre; and those poles are required to be renewed every six years in the ordinary way, but if prepared by Mr. Kyan's process the poles would last for thirty years; then it will be at once evident that a sum of 400,000*l.* will be annually saved upon the 500,000*l.*, or, in other words, the annual expense to the hop-grower would be, by the adoption of

Mr. Kyan's process, one-fifth of what he at present incurs.

The mode in which the application of the solution takes place, is in a Tank similar to the model on the table. (*See Frontispiece.*) They are constructed of different dimensions, from 20 to 80 feet in length, 6 to 10 in breadth, and 3 to 8 in depth. The timber to be prepared is placed in the tank, and secured by a cross-beam to prevent its rising to the surface. The wood being thus secured, the solution is then admitted from the cistern above, and for a time all remains perfectly still. In the course of 10 or 12 hours, the water is thrown into great agitation by the effervescence occasioned by the expulsion of the air fixed in the wood, by the force with which the fluid is drawn in by chemical affinity, and by the escape of that portion of the chlorine or muriatic acid gas which is disengaged during the process. In the course of 12 hours this commotion ceases, and in the space of 7 to 14 days (varying according to the diameter of the wood,) the change is complete, so that as the corrosive sublimate is not an expensive article, the albumen may be converted into an indecomposable substance at a very moderate rate. But this is not all, the *seasoning* will take place in the course of two or three weeks. Instead, therefore, of the Government requiring a three years' stock of timber for the purpose of seasoning (as is the case in many of the Government, as well as private yards,) the effect by Mr. Kyan's process

would be produced in a few days. The loss which arises from a diminution of one-third of the timber in the progress of seasoning, as well as the injury sustained by the sheds and pits in which the timber is placed to season, would be entirely prevented, and the whole secured from the destruction of dry rot by a short and economical process.

There were, however, examples remaining on the table which were still more striking, and shewing the importance of Mr. Kyan's discovery to the British Navy; and he (Dr. Birkbeck) had reserved his remarks upon them from a deep sense of the magnitude of the benefits this discovery would confer on every Maritime Nation whose seamen were objects of solicitude and pride, and whose revenues imposed economy.

A piece of oak was on the table, which had been introduced into one of the most villanous cavities (with regard to the condition of the wood) that could possibly exist. He alluded to the fungus pit at Woolwich, where it is said no substance, either vegetable or animal, can by possibility escape destruction. The piece of wood to which he (Dr. Birkbeck) called most particular attention, had been five years in that severe place of test, surrounded by decaying matter—by the decaying property of the pit—by the heat generated by that decay—and by the quantity of carbonic acid which always exists in the pit, and escapes in great quantities when the doors are opened. After remaining three years in

this pit, it was exposed to the air for six months, and, in order to test it still more completely, it was again introduced into the pit, where it remained for two years longer. *This is a probation which must be considered quite sufficient to decide the question.*

There was not the slightest disintegration or mouldering of any of its fibres,—it exhibited no appearance of generating any animal or vegetable matter,—it retained all the hardness, elasticity, and difficulty of bending, that belongs to the oak,—and, therefore, it may truly be said to have remained perfect in spite of all the circumstances to which it had been exposed. The truth of what had happened to this piece of wood, is established by a memorandum which was signed by those who were spectators of the removal. It states, "*That on the* "19*th of July,* 1833, *the wood was removed from* "*His Majesty's Fungus Pit at Woolwich, in the* "*presence of the subscribing gentlemen*; *that the* "*block of timber that was taken out formed part of* "*a larger block,—that it was sawn through, and* "*split into three pieces in their presence, and that* "*it was found to be in a sound and healthy state,* "*perfectly free from insects, and every appearance* "*or symptom of dry rot or decay.*"

He would now advert to a most important fact, relative to the effect of Mr. Kyan's process in the preparation of ship timber. Recently some very ingenious gentlemen have chosen to believe that, in the application of timber thus prepared for ships,

the crews might be effected injuriously by the exhalation or evaporation of the corrosive sublimate, forgetting, or not knowing, that the corrosive sublimate is decomposed, and that it will not sublime at any such temperature as ever takes place in the hold of a ship. But facts and experiments, as far as they have been made in the building of ships, and also in their being inhabited by seamen, tend to the proof that ships constructed of prepared timber will be more healthy than in those built of ordinary timber. One fact in science, all will allow, will convey more conviction than a multitude of suppositions, however strong and apparently derived from just principles. But he (Dr. Birkbeck) requested attention, previous to the mention of *that fact* which he regarded as most important and conclusive, while he stated that it was in accordance with every true principle, as well as correct in theoretical deduction, that ships should be more healthy when built of the prepared timber; for timber, when decomposing or decomposed, must affect the surrounding atmosphere,—more especially the confined air in the hold of a ship,—and, consequently, such vitiated air must tend to promote the decomposition in the wood; and thus, by action and reaction, both vessel and crew suffer from atmospheric deterioration. On the other hand, timber saturated with a solution of corrosive sublimate would be antiputrescent, and neither be the cause of any vitiated state of the internal atmosphere of the ship, nor be affected by it.

The French Government, who are ever alive to every improvement, and are anxious to remedy the defects in their vessels, have, in the statistical accounts of the French navy, most clearly proved that the mortality of the crews is far greater on board *new built* than in *old* vessels; and this they attribute solely to the active and profuse exhalation arising from the fresh timber while generating dry rot, and subsequently decomposing; and the sickness of the crew is further increased by the exhalation of the sulphuretted hydrogen from the *bilge water,* which of course, permeating as it does in small portions through every seam and interstice of the decomposed and decaying timbers, becomes, when collected in the hold, quite putrescent, and the incessant source of noxious vapours.

Now he (Dr. Birkbeck) would state *the fact,* which appeared to him to silence at once all casuistical objections to the application of Mr. Kyan's process to the British Navy, as well as to every other class of vessels.

In August, 1834, there was a ship, the "Samuel Enderby," built at Cowes, of 420 tons, in which every timber, sail and rope, was *prepared* according to Mr. Kyan's process. During the *building* of this vessel, in the yard of Mr. White, the shipwrights were unusually healthy, most unequivocally proving that no volatilization does take place from the timber; for if such were the case, it would occur immediately after immersion in the solution, and those

persons engaged in building the vessel would perceive, or be affected by it. Therefore it is very satisfactory and conclusive, if no volatilization takes place in *building* the vessel, and shipwrights experience the reverse of any ill effects from working among prepared timbers, that the crews of such vessels may navigate them with additional confidence, both with regard to health as well as safety.

The "Samuel Enderby" came up channel to London to be fitted for the South Sea Fishery, and just before she sailed, after three months of that very hot weather which all must remember, her hold was examined, and the *bilge water*, to the surprise of every nautical person, was found to be perfectly sweet, both as to taste and smell. He (Dr. Birkbeck) understood that this fact had, among naval men, excited the greatest surprise, and was considered alone as carrying conviction to every mind of the *salubrity* as well as other advantages of the process.

No further comment did he deem necessary, as he thought what had been shewn, both by reasoning and facts, that evening, was sufficient to prove most incontestibly that at length an effectual antidote was discovered and established for the prevention of that bane in timber, which had cost the nation such vast sums, and which was dreaded in every domestic building.

What would be the result of the application of this plan to the Navy, he (Dr. Birkbeck) would

point out by what was stated in a very able work from the pen of *Mercator,* which had been published on the subject of the expenses occasioned in the Building and Repair of vessels in the Navy. The cost of an average number of years would there be seen, and the result easily understood, without a detail of the particulars, in the quotation he was about to read.

"Having thus," says the writer, "particularly called your "attention to the Character and Amount of the Repairs of "the Navy, I shall proceed to point out what would be the "*probable Annual Saving to the country by a Certain Pre-* "*vention of Dry Rot in Timber.* On careful investigation of "the subject, it will be obvious that enormous diminution of "expense would arise from various resources! but I shall "found my calculation on the figures of the Estimates, and "subsequently merely advert to the additional saving from "other considerations. The average duration of ships built "of ordinary timber has been variously stated—seven, eight, "and ten years. If Dry Rot were prevented, and the ships "subject only to ordinary casualties, it may be fearlessly "asserted that thirty years at least would be their average "duration.

"Assuming such difference,—therefore, if in a Navy, built "and repaired of Timber, whose duration is ten years, in "order to keep up the number by Building, as well as to "Repair them, the annual average sum of 1,190,613*l.*,—it is "very evident that ships built and repaired of timber whose "duration would be thirty years, would have required only "the annual average sum of 396,871*l.*, to keep up their "number by Building and Repairs; and there would have "been, under such circumstances, an annual saving to the "country of 793,742*l.*, or, in the twenty years, the total of "15,974,840*l.*

"It may be urged that this calculation is not applicable to "the present time of peace: but the Navy Estimates for all "Repairs, from 1822 to 1832, amounted to 7,971,852*l.* 7*s.* 4*d.*, "being an annual average of nearly 800,000*l.* Let the same "principle of calculation be applied to these latest Estimates, "in times of peace, and the amount will be sufficient to excite "the most serious attention to this important subject."

In fact, remarked Dr. Birkbeck, the application of this discovery may be said as yet to be in embryo, as the extent to which it may be carried will be better understood when it has been contemplated properly by the public. It is, therefore, earnestly to be hoped that those who are concerned in the formation and preservation of the British Navy will pay the greatest attention to the subject; and that those also who are employed in a less extended sphere will not neglect an opportunity of protecting the buildings they erect. If it be true that every man's house is his castle, it is very desirable that the foundation of that castle should always be secure; so that while he believes himself to be placed in a spot that is impregnable, he should not find it in hourly danger of tumbling about his ears. So with that Navy, which is the pride and bulwark of Great Britain, it is to be hoped (although it is desirable it should long be laid up in ordinary,) that it should be rendered secure, when called into active service, from the ravages of that destructive evil which has hitherto cost the country such enormous annual sums. Indeed, it may truly be said that in a maritime war, the dry rot in ships has hitherto been the greatest expense to the country. But there is

another class of vessels about which all must feel deeply interested. Our ships are navigating in every direction, and it is not to be endured that the lives of our seamen and the property of our countrymen should be endangered by the instability of the material of which these ships are composed, when there exists a power and a prospect of giving perfect firmness and durability to the substances employed in their construction. It is also most desirable that, while British ships are spreading the fruits of our arts, our science, and our civilization, through every part of the known world, they may not have to encounter more dangers than those which arise from the insecurity of winds and waves; and that while we extend the wealth of Great Britain over every portion of the habitable globe, we may also disseminate the results and advantages of such important discoveries as that which has this evening been the subject of our consideration."

END OF LECTURE.

APPENDIX.

OBSERVATIONS

ON THE

ADVANTAGES TO TIMBER, &c. BY THE APPLICATION

OF

MR. KYAN'S PROCESS.

Prevention of Dry Rot.

The process here employed, completely and with certainty prevents the possibility of the destructive effects of the active principle which nature employs to cause decomposition and decay. When this principle is exposed to moisture within certain degrees of temperature, fermentation commences, and, under various forms and modifications, proceeds from partial to total decomposition. Corrosive sublimate neutralizes this primary element of fermentation, forming a new chemical compound, which is solid, insoluble, inert, and does not attract moisture. By this chemical change the fibre of the wood is rendered as indestructible as charred timber, when, by the action of fire, the same fermentative principle is totally decomposed or destroyed.

The perfect and certain Seasoning of Timber.

A desideratum almost as important as the prevention of Dry Rot, and for many domestic purposes more so, is the perfect and certain seasoning of timber. To effect the seasoning of timber in the usual way, it is left seldom less

than three years, and often as long as six or eight years, protected from wet, but exposed freely to the air. By this means the destructive principle is dried, and, under common circumstances, rendered inert. But when the timber is afterwards exposed to great moisture, &c. (the fermentative principle being soluble when merely dried), it will sometimes be again called into action. The process already described for the prevention of Dry Rot has not only altogether destroyed this principle, and rendered it inert, but, by making it solid and perfectly insoluble, has removed it from the action of moisture altogether. It has thus lost its hygrometic properties; therefore, prepared or patent-seasoned timber is not liable to those changes of atmosphere which affect that which is seasoned in the common way. It is scarcely necessary to point out the great importance of the process, in this point of view, to joiners, cabinet-makers, &c. &c., inasmuch as all wood, including mahogany, and the finest and most expensive woods, may thus be seasoned, with the greatest certainty and perfection, in the short space of two months, instead of the years at present employed.

Protection from all Insects, &c.

During the time the timber is immersed, the solution insinuates itself into every pore throughout the whole of the wood, and in whatever state the mercury presents itself, either under the form in which it is in the solution, or in the solid form which it assumes when partially decomposed by the fermentative principle; it is equally efficacious in preventing the destructive effects of animals of every kind. Thus vessels, by being composed of timber prepared in the manner here described, will be protected from the various kinds of animals which adhere to, or injure them, as completely as if they were coppered.

Application of the Process to Canada and British Timber.

Canada timber is much more liable to decay than that grown in the northern parts of Europe, and for this reason is never used in buildings of a superior description. The principle of decay being destroyed as above shewn, this objection is no longer in existence; and this kind of timber may now be employed with as great security as that of a superior quality and higher price.

The same observation applies with great force to timber of British growth, particularly to that of Scotland, much of which is at present considered of very little, if any value for durable purposes, on account of its extreme liability to decay, whether in exposed situations or otherwise. The present process will therefore render of considerable value plantations of larch, firs of all kinds, birch, elm, beech, ash, poplar, &c., which are the chief products of the great wooded estates, and which, when prepared, may be advantageously employed to most useful purposes.

Preservation of Canvass, Cordage, &c. from Mildew, &c.

When canvass, cordage, calico, &c. are exposed to moisture at the usual temperature of the atmosphere, the decaying principle which they possess, in common with all other substances of vegetable and animal origin, is particularly active, and will, in the course of a few weeks, destroy their texture to such a degree that they will not even hold together. This was the case with both canvass and calico, when exposed in the fungus pit in Woolwich Dock-yard from August 1832 to February 1833, as well as in the trial made by Professor Faraday, on pieces placed in the cellar of the Royal Institution from the 10th December, 1832, to 21st February, 1833, and from 15th December to

the same date. (See page 11.) The corrosive sublimate acts precisely in the same way as on timber, neutralizing the element of decay, converting it by mutual combination into an insoluble, inert, and indestructible compound, which therefore cannot be removed by subsequent moisture or wet, but becomes as much a part of the cloth, &c. as the fibres of which it is composed. The destructive principle being removed by being rendered inert, moisture has no longer any substance on which it can act, and the fibre is preserved in its full strength.

Purposes for which the Prepared Timber, &c. would be highly useful.

HOUSES,* FARM-HOUSES, OUT-HOUSES,	Large timbers Floors Roofs, gutters, &c. Furniture, and all joiner's work,	Preserved from Dry Rot, and perfectly seasoned.

Posts Rails Gates Park paling Fences Hop-poles Felloes Spokes Shafts, &c. &c.	For these purposes any kind of timber may now be used, instead of the more expensive kinds. It will also supersede, in many cases, the employment of iron, from its acquired durability and greater economy.

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* The following is an estimate of the extra expense of using prepared timber in buildings:

First rate, 25 loads of timber. Second do. 12 do. Third do. 10 do. Fourth do. 8 do.	At an additional expense to the landlord of twenty shillings per load.

PUBLIC WORKS.

All wood exposed to moisture, as in
Docks
Bridges
Piers, jetties, &c.
Canal gates and works
Sleepers for rail-roads, instead of stone
Piles for foundations, &c.

} Preserved from Dry Rot and Insects.

NAVIGATION.

VESSELS OF ALL KINDS.

Steam-boats,
Masts and Spars,
Barges,
Boats, &c.

CANVASS, CALICO, &c.

FOR

Sails,
Awnings for all purposes,
Covers for carts,
Bags and sacks,
Cloth blinds for houses,
Tents,
Rick cloths,
Tarpaulings,
Hammocks, &c.

ROPES AND CORDAGE

FOR

Shipping,
Warehouses,
Cranes,
Whalers' lines,
Fishing nets,
Garden nets, &c.

COPIES

OF

OFFICIAL DOCUMENTS AND CORRESPONDENCE

WITH

THE ADMIRALTY.

Admiralty; March 4, 1828.

Sir: In the absence of Captain Spencer, I am commanded by his Royal Highness the Lord High Admiral to acknowledge the receipt of your letter of the 3d inst. on the subject of the Dry Rot, which has been sent to Sir Byam Martin, at the Navy Office.

I am, sir, your most obedient servant,

JOHN MILLER.

To J. H. Kyan, Esq.

Navy Office; March 6, 1828.

Sir: His Royal Highness the Lord High Admiral has sent me your letter of the 3d, and I have to acquaint you, that any proposition on the subject of preserving timber, which you may address to the Commissioners of the Navy, or to me, shall receive due consideration.

I am, sir, your obedient servant,

T. B. MARTIN.

To Mr. Howard Kyan.

In compliance with these instructions from the Comptroller of the Navy, Mr. KYAN prepared a piece of English oak, which was, on the 9th of June, 1828, submitted to trial in the pit, subject to foul air and fungus mould, for trying and proving the durability of timber, at his Majesty's Dock-yard at Woolwich. In the month of March, 1830, application

was made to the Navy Board for an Inspection and Report thereon, which was as follows:

Navy Office; March 6, 1830.

Sir: I have received and laid before the Commissioners of the Navy your letter of the 3d inst., requesting an order to inspect the piece of timber prepared by you in 1828, *for the prevention of the Dry Rot; and am commanded to acquaint you that they do not consider it should be examined under* THREE *years at least, as no inference can be drawn of the effects of your process under that period.*

I am, sir, your humble servant,

G. SMITH.

To Mr. J. H. Kyan.

At the expiration of *three* years an Inspection was granted, and a Report obtained, of which the following is a copy:

Navy Office; July 9, 1831.

Sir: I am commanded by the Commissioners of the Navy to acknowledge the receipt of your letter of the 4th inst., and to acquaint you that the piece of oak timber prepared with your solution for preventing the Dry Rot, has been examined by the officers of Woolwich-yard, and reported to be SOUND. *I am to add that, with a view to ascertain further the merits of your solution, the Board will give you an opportunity of preparing, at your own expense, some pieces of timber, to be put in that part of a ship most liable to decay.*

I am, sir, your humble servant,

G. SMITH.

To Mr. Kyan.

In December, 1831, the following Report, from the Surveyor of the Navy, was made to the Lords of the Admiralty:

"*Mr. Kyan, about three years and a half since, prepared a piece of Oak as a preventive to the Dry Rot: this specimen was*

put into a Capstan-hole at Woolwich Yard, which place is subject to the Fungus Rot. After having been there for THREE YEARS, *it was found to be* SOUND. *This circumstance induced the Navy Board to request Mr. Kyan, in July last, to prepare some other pieces, to be put in such situations in a ship as are the most subject to decay; to be placed in competition with similar pieces of timber treated according to the present practice in the King's Yards. As this gentleman has not explained the nature of his composition, I can give no opinion thereon.*

"R. SEPPING.

"*December* 20, 1831.

"*To the Right Hon. Sir James Graham, Bart.*"

It will be observed, by the preceding letter of Sir R. SEPPING, and by reference to the one of Mr. SMITH, of March, 1830, that this piece of Timber, at this period, (December, 1831,) had been undergoing the proof of the Fungus Pit for a period of *three years*, viz. from June, 1828, to July, 1831.

In July, 1831, it was taken out of the pit, and left exposed to atmospheric air, under the custody of the Government Officers, until September, 1832, being a period of fifteen months. It was then replaced in the pit, in order to try if the alteration of circumstances had diminished the effect of Mr. KYAN's process. At the same time were placed in the pit several pieces of Canvass and Calico, both *prepared* and unprepared.

On Tuesday, the 19th of February, 1833, the Fungus Pit was opened, in the presence of Professor FARADAY, J. G. LOCKHART, Esq., WILLIAM FARRELL, Esq., Architect, of Dublin, and several other scientific gentlemen; when the *Cube of Wood*, and all the other Prepared Timber, Canvass, and Calico, were found to be perfectly sound, and the Unprepared in rapid progress to decomposition.—*(See Quarterly Review for April, No.* 97, p. 132.)

On Friday, the 19th of July, 1833, a further inspection of the pit took place, in the presence of Captain WARREN, C. B., Resident Superintendent of his Majesty's Dock Yard, at Woolwich, and several other gentlemen, consisting of Members of Parliament, Merchants, &c.

The piece of Timber which had been for upwards of *five years* under trial of the *Admiralty* was examined, and found to be perfectly sound in every respect. It was then split through the centre into two pieces, one of which pieces was again divided into two pieces, and a Certificate (of which a copy is subjoined) was attached to one piece, signed and sealed by Captain WARREN and the gentlemen present; and this piece may be seen at No. 2, Lime Street square, London.

" *Memorandum,—That on the* 19*th July*, 1833, *we, the* " *undersigned, were present at the opening of the Well or Pit,* " *called the Fungus Pit, in his Majesty's Dock Yard, at* " *Woolwich, in the county of Kent, and did see this Block of* " *Timber taken out of the same. And we hereby certify, that* " *it then formed part of a large Block, and that the same was* " *immediately sawn through, and divided into three pieces, in* " *our presence; and that it was found to be in a sound and* " *healthy state, and perfectly free from insects, and from any* " *appearance or symptom of Dry Rot or Decay.*

" TIMOTHY ABRAHAM CURTIS, (L.S.)

" THOMAS STARLING BENSON, (L.S.)

" FRANCIS HARVEY, (L.S.)

" THOMAS WRIGHT NELSON, (L.S.)

" SAMUEL WARREN, (L.S.)
(Captain R.N., C.B. Superintendent of Woolwich Dock Yard.)

" JOHN STORY PENLEAZE, (L.S.)
(M.P. for Southampton.)

" J. O. D. JEPHSON, (L.S.)
(M.P. for Mallow.)"

ADDITIONAL LETTERS AND TESTIMONIALS.

Dear Sir, *Dublin, 33, Dawson Street; April* 8, 1834.

I am favoured with your letter of the 30th ult., requesting I would state to you the opinion I had formed respecting the Timber prepared according to Kyan's Patent for the prevention of Dry Rot.

From the dreadful ravages the Dry Rot has occasioned in buildings that have come under my professional practice, I have long felt most anxious on the subject; it was therefore with great satisfaction that I attended the examination which took place at Woolwich, of the prepared and unprepared blocks of oak that were deposited in the fungus hole of the Dock Yard.

The blocks that had undergone the Solution were, in my opinion, in a perfect state, while those that had not undergone the process were in an advanced state of decay. I had the curiosity to cut thin pieces from each of the blocks; I found the fibre of what I took off the prepared—quite sound, and that taken off the unprepared—short and brittle.

It is but a very short time since, on speaking in favour of the process, that I again examined the specimens: *the prepared one preserves all its toughness, while the unprepared has nearly mouldered into powder.*

I am, dear Sir, yours truly,

William Farrell, *Architect.*

Sir, *Dorset Street, Salisbury Square; June 5, 1834.*

Having made trial of "Kyan's Patent," as regards its efficacy in seasoning the material to which it is applied, I have much pleasure in stating its *complete success* in both the experiments I have made; the particulars of which are as follows:

No. I. Hispaniola Mahogany.

Cut out of the Log	March	9, 1833.
Sent to be saturated	April	12, 1833.
Used in a Wrythed Handrail.....	June	21, 1833.

No. II. Hispaniola Mahogany.

Cut out of the Log	March	25, 1833.
Sent to be saturated	June	4, 1833.
Used in a Clampt Flap and Frame ...	August	30, 1833.

In neither of the above instances has there been the *least shrinking* of the wood since it has been used, nor has the *colour* of the Mahogany been at all injured by the process.

I am, &c. George Ward.

Sir, *Westminster New Bridewell; February 17, 1834.*

I acknowledge the receipt of yours on the 15th instant, and beg leave to say that you may find me at the Westminster New Bridewell any hour of the day on Thursday next, when I shall be glad to show you the pieces of timber with your own stamp on them, and the duplicate pieces that have not been prepared in your solution, which will afford a very satisfactory result to any person.

The method I adopted to obtain these results was, first of all to select a piece of defective oak, viz. a piece that had sap on one edge and heart of oak on the other, to obtain a result so much the quicker.

If you examine your order book, you will find that, on the 14th of September, 1832, you received some Tie-beams from me to prepare for the New Prison; with them I sent five small pieces, to be prepared also, for my own satisfaction. These pieces I received September 28, 1832, as prepared by you. On the 30th of September, 1832, I placed the aforesaid five pieces that had been prepared, also the five duplicate pieces that had not been prepared, in a Dry Rot Pit; and to the 30th of November, 1833, I took the aforesaid pieces out, and left them in a dry office until the 14th of February, 1834, when I examined them, and obtained the most satisfactory result. *The whole of the pieces that had been prepared were as good as when first put in the Rot Pit, both as to spine and sap; the duplicate pieces that were not prepared are so rotten in the sappy parts, that you can run a penknife through them;* the spiny parts will of course take a longer time to give any result. I have sent two pieces of oak to the architect of the New Prison; two pieces to my friend, Mr. Nowell, Mason to his Majesty William the Fourth; and have also exhibited two other pieces, and explained the result, to my friend, Mr. Armstrong, Builder. This I have done with pleasure to myself, and I am glad it is to your satisfaction.

I am, Sir, yours most respectfully,

W. Butler,

Resident Clerk of Works, Westminster New Bridewell.

In July, 1832, Messrs. Harris and Warner, Hat Makers, Southwark Bridge Road, replaced the floors of a warehouse on their premises; and, in order to try the effects of Mr. Kyan's Process, part was Timber *prepared* by him. The result is proved by the following certificates:

No. 1.

Southwark; February 5, 1834.

"*Memorandum—That this piece of Deal Board* (*No.* 1,) *to* "*which the Certificate is attached, formed part of the Flooring*

" of a House on our premises, in Southwark, subject to Dry Rot,
" so much so that it became necessary to replace the floors every
" three years. In the month of July, 1832, *it was laid down,*
" and next to it a piece of Prepared, of Mr. Kyan's, No. 2. *The*
" effect of each is exhibite l by the annexed pieces, and taken up
" in January, 1834, *in our presence.*

" Given under our hand,

(Signed) " HARRIS AND WARNER.
" CHARLES BROWN."

No. 2.

" Southwark; February 5, 1834.

" Memorandum— That the piece of Deal Board (No. 2,*)*
" to which this Certificate is attached, formed part of a Flooring-
" board prepared by Mr. Kyan's Process, and laid down in a House
" on our property, in Southwark, in the month of July, 1832,
" and taken up in the month of January, 1834, *in our presence,*
" when it was found to be in a sound and healthy state, free
" from insects and worms, and from any appearance or symptom
" of Dry Rot or Decay.

" Given under our hand,

(Signed) " HARRIS AND WARNER,
" CHARLES BROWN."

MY DEAR SIR, 8, *Wellington street; July,* 1833.

I was greatly disappointed to have missed the pleasure of shewing you the progress of your experiment. I have already stated to you that our vaults are unusually subject to Dry Rot and the growth of Fungus, which does us no little mischief, and could be checked only by letting in currents of air, which would cause an alteration of temperature highly injurious to our Wine.

As I had some years ago observed an instance of very rapid decay of some Cord left by neglect in the vaults, I considered they afforded a fair opportunity of verifying the truth of your expectations, of the effect of your Specific on vegetable Matter, and was led, by the striking facts stated by Mr FARADAY, to

solicit your permission and assistance in trying the following experiments, under my own immediate care and inspection.

On February 23, 1833, I suspended a four-pound weight from each of three pieces of Cord, two yards in length, in three different places in our vaults. I placed a piece similar on some Fungus in another part of the same vault, coiled up. Close to each of these, under exactly similar circumstances, I placed portions of Cord, cut from the same roll, and immediately adjoining, (so that there could be no variation in texture,) which had been previously dipped in your Solution. On the 8th o March, I could perceive Fungus growing on each of the Unprepared Cord; by the 15th, it had become very thick; 27th of June, the Cord in vault 5 broke; 4th of July, the Cord in vault 7 broke; 15th of June, I found the Cord placed on the Fungus and coiled up, eaten by wood-lice.

The other piece of Cord now remains entire, but covered with Fungus. *All the Prepared Cords are as clear as when they were first put down.* I have replaced the broken cord, July 17, 1833. On the 2d of March, I placed four pieces of Calico and four pieces of Canvass prepared, and an equal number unprepared; *the Prepared is quite clear and untouched, whilst the Unprepared is in various states of decay.* I have cut off portions of the Cord; that marked No. 5, is from 5 vault; that No. 7, from 7 vault; No. 4, from 4 vault, which is where the wood-lice have been: also corresponding pieces of the Prepared.

As the experiment ought to be carried much further, I mean to keep a Memorandum of the decay of each piece of Cord, and supply its place until the prepared Cord itself observes symptoms of decay; and shall always consider the experiment as open to you or your friends for inspection: with every wish that you may have the benefit of this valuable discovery, and render it useful to the public,

(Signed) W. P. Richards.

To John Howard Kynn, Esq.

FINIS.

ANTI DRY-ROT COMPANY,

(Kyan's Patent,)

CONSTITUTED AND EMPOWERED BY ACT OF PARLIAMENT.

The COMPANY prepare TIMBER, CANVASS, and CORDAGE, at the following STATIONS in LONDON:

PRINCIPAL STATION.

SOUTH DOCK, WEST INDIA DOCKS.

BRANCH STATIONS.

GROSVENOR BASIN, PIMLICO.
CITY-ROAD BASIN.
SURRY CANAL DOCK, ROTHERHITHE.

The COMPANY, for the convenience of the SHIPPING INTEREST, have FLOATING TANKS, which can be sent to any Ship-Builder's Yard in the River Thames.

THE indisputable Testimonials given by men of the first talent and experience in the kingdom, as to the perfect reliance that may be placed upon KYAN'S PROCESS of PREPARING TIMBER to resist the effect of DRY ROT, and other decay, are so entirely satisfactory as to require no further remark.

The efficacy of the Process is sufficiently established by the Evidence contained in the Report to the Lords of the Admiralty, and subsequently presented to, and printed by, the House of Commons; and likewise by the adoption of it by his Majesty's Government in Portsmouth Dock Yard.

The Process is of the utmost importance to a MARITIME and COMMERCIAL COUNTRY like Great Britain, for it is a certain Preventive of those destructive Ravages from Dry-Rot—and consequent enormous Loss of Capital to the Ship-owner—which have hitherto prevailed in Vessels of every description; and to the SHIPPING INTEREST the Process is doubly valuable, for, as is clearly proved, it prevents Mildew and Decay in Canvass as well as in Timber.

By the use of this Process, BRITISH AMERICAN TIMBER will be rendered equally as valuable as Timber from the Baltic; and thus the produce of BRITISH COLONIES will be encouraged in preference to Timber of Foreign growth.

It is found that Timber cut down while in a state of active vegetation, with the leaf growing, becomes, by the application of this Process, immediately fit for use;—thus rendering every species of DOMESTIC TIMBER of the same value and as available as the best Foreign, for all purposes incidental to Farming and Husbandry;—and, by the use of the most common Woods, economy will be combined with durability, and the AGRICULTURAL and MINING INTEREST will derive most incalculable advantages.

Purposes for which the prepared Timber, &c., is available:

Public Works.	**Shipping.**
Docks,	Steam Boats,
Bridges,	Barges,
Piers and Piles,	Boats,
Sleepers for Railways,	Masts and Spars, &c.

Buildings in General.

POSTS, RAILS, GATES, FENCES, PARK PALINGS, HOP POLES, &c., &c.

For these purposes any kind of Timber may now be used, instead of the more expensive kinds. It will also supersede, in many cases, the employment of Iron, from its acquired durability and greater economy.

Prepared Canvass, Calico, and Ropes, for

Sails, Hammocks, &c.	Rick Cloths, Tarpaulings,
Tents,	Sacks, Bags,
Awnings and Cloth Blinds,	Fishing-Nets, &c.

The Company grant Licences, for the use of the Patent Process, to SHIP-BUILDERS, TIMBER-MERCHANTS, &c., for the purposes of their Trade; and to NOBLEMEN, GENTLEMEN, &c., for their Private Estates.

Application to be made to the SECRETARY, 2, Lime Street Square, Leadenhall Street.